

News

Earth Sciences Priorities

Priority research areas for the solid earth sciences were recently identified by two blue-ribbon panels. Each suggested specific areas where funds should be targeted for rapid advances in expanding our knowledge of the earth and for long-term payoffs both in basic research and in training the next generation of earth scientists.

In its report released last week, the Research Briefing Panel on the Solid Earth Sciences identified five priority research topics. In a report issued earlier this year, the Committee on Opportunities for Research in the Geological Sciences selected for top billing eight such research areas. The common scientific thread running through both reports: More research is needed on the structure, composition, and evolution of the continental lithosphere and on the dynamics of tectonic processes.

The Research Briefing Panel on the Solid Earth Sciences (see box), was formed by the Committee on Science, Engineering, and Public Policy (COSEPP) of the National Academy of Sciences, the National Academy of Engineering, and the Institute of Medicine. The panel prepared its report for the Office of Science and Technology Policy (OSTP), NSF, and selected federal departments and agencies. OSTP Director George A. Keyworth, II, who also is President Ronald Reagan's science advisor, is a long-time advocate of setting priorities for research support (*Eos*, May 10, 1983, p. 371) and has repeatedly praised the National Research Council's (NRC) Astronomy Survey Committee for setting out its priorities last year in what is commonly called the "Field Report," after committee chairman George B. Field (*Eos*, May 18, 1982, p. 306).

The Committee on Opportunities for Research in the Geological Sciences (see box) was formed by the NRC Board on Earth Sciences (BES) at the request of James F. Hays, director of the division of earth sciences of the National Science Foundation (NSF). Hays requested the BES, formerly the Geological Sciences Board, to report on "the state of science and to recommend policy for the decade of the 1990s relevant to the academic community and to the nation's needs." *Opportunities for Research in the Geological Sciences*, emphasizes earth science research that has "typically been supported" by NSF. NSF provides 90% of all federal funds going to colleges and universities for basic geological sciences research. Among the relevant reports on which the COSEPP briefing panel based its recommendations was the BES committee report.

The COSEPP briefing panel identified five topics that would be likely to yield significant scientific payoffs with increased funding in fiscal year (FY) 1985; the BES committee looked at FY 1985 and ahead to FY 1990. President Reagan will send his proposed budget for FY 1985 to Congress by mid-February. The briefing panel report "emphasizes areas that lie on the frontiers of earth sciences... and describes some of the conceptual and technical advances that make it possible to explore more fully the third and fourth dimensions, depth and time." The five areas are:

- seismic investigations of the continental crust
- continental scientific drilling
- physics and chemistry of geological materials
- global digital seismic array
- satellite geodesy.

Of the specific projects recommended, some "such as deep continental drilling, determination of the continental geoid, and crustal seismic reflection, can proceed immediately if resources are made available," the panel says. "Others, such as large seismic arrays, expanded isotopic exploration of the crust and mantle, monitoring of crustal motions, and the study of chemistry and physics of geological materials, require major investments in modern facilities."

The BES committee, on the other hand, identified eight areas "having the most promise for advancing geology in the next decade." With the exception of the first topic listed, no significance is intended by the order. The eight areas are:

- more detailed and accurate definitions of the structure and composition of the continental lithosphere, including the continental margins
- quantitative models for sedimentary basin evolution
- improved understanding of magma generation and emplacement
- knowledge of the physical and chemical properties of rocks
- a better understanding of tectonic processes, the physical and chemical states that produce them, and the structures that result
- a model of convection in the earth's interior
- evolution of life
- surficial processes.

While the COSEPP briefing panel did not make specific funding recommendations, the BES committee did. "In our view," the committee report states, "an appropriate response to the needs of the field would require an annual increment of \$21 million to the President's 1984 budget." President Reagan's fiscal 1984 budget proposal for the earth sciences division was \$42 million (*Eos*, February 15, 1983, p. 65). By fiscal 1990, the BES committee report continues, "a goal of an additional \$53 million over the 1984 budget for NSF's Division of Earth Sciences is a justifiable and realistic goal." The committee recognized, however, that "funding recommendations for FY 1990 are naturally more speculative." Among the initiatives suggested by the BES committee are a program of continental drilling (with a suggested funding level of \$4 million in FY 1985 and \$20 million in FY 1990). Funding for seismic reflection studies should be doubled, in the committee's view.—BTR

Solid Earth Sciences Panel

Charles R. Drake of Dartmouth College (and AGU President-Elect) and Don L. Anderson of the California Institute of Technology cochaired the COSEPP Research Briefing Panel on the Solid Earth Sciences.

Members of the panel were William R. Dickinson, Univ. of Arizona; Carl Kinsinger, CRES, Univ. of Colorado; John C. Maxwell, Univ. of Texas at Austin; V. Rama Murthy, Univ. of Minnesota; Jack E. Oliver, Cornell Univ.; C. Barry Raleigh, Lamont-Doherty Geological Observatory; Frank M. Richter, U.S. Geological Survey; Edward Stolper, CalTech; and Peter J. Wyllie, CalTech.

Committee on Opportunities for Research in the Geological Sciences

William R. Dickinson of the University of Arizona chaired the Committee on Opportunities for Research in the Geological Sciences, appointed in 1982 by the National Research Council Board on Earth Sciences (formerly the Geological Sciences Board).

Committee members were Samuel S. Kohn, U.S. Geological Survey; Robert L. Anderson, U.S. Geological Survey; John C. Maxwell, U.S. Geological Survey; Charles R. Drake, Dartmouth College; John C. Maxwell, U.S. Geological Survey; Charles R. Drake, Dartmouth College; John C. Maxwell, U.S. Geological Survey; Charles R. Drake, Dartmouth College.

0930 Seismic methods
ANALYSIS RELATING TO THE REDUCTION OF SCATTERED WAVES
ON DEEP MARINE SEISMIC RECORDING
J. James Van Der Bruggen, P.O. Box 429, Seattle, WA 98146

The rough and uneven seabed is a potential source of seismic noise. The noise is generated by the interaction of the seismic waves with the seabed. The noise is generated by the interaction of the seismic waves with the seabed. The noise is generated by the interaction of the seismic waves with the seabed.

An analysis of the seismic waves scattered by the seabed is presented. The analysis is based on the theory of scattering by a rough surface. The analysis is based on the theory of scattering by a rough surface. The analysis is based on the theory of scattering by a rough surface.

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Winter Weather Forecast

A milder-than-normal winter is predicted for the eastern and western extremes of the United States, while the country's midsection can expect colder than normal temperatures, according to the winter weather outlook issued November 28 by the National Oceanic and Atmospheric Administration's National Weather Service (NWS). The outlook (Figure 1, top), which covers December, January, and February, also predicts that the Northwest, Midwest, and the lower Mississippi valley can expect greater than normal precipitation (Figure 2, top).

Independently, researchers with the Climate Research Group at the Scripps Institution of Oceanography (SIO) issued their winter weather forecast on November 29. While the temperature outlook by Jerome Namias and Daniel Cayan (Figure 1, bottom) shows a similar—though not identical—pattern to the NWS prediction, the SIO researchers' precipitation prediction (Figure 2, bottom) is very different from the NWS one.

Donald L. Gilman, chief of the NWS predictions branch, said that the probabilities of a warmer than normal winter exceed 55% in the East and South, rising through 60% along the Appalachian Mountains to at least 65% on the east coast from Florida to Massachusetts. The probabilities of warmer than normal temperatures reach a maximum of 70% from South Carolina to Long Island. Except for the extreme Northwest and interior California, the probability of a relatively warm winter exceeds 55% everywhere west of the Continental Divide. The probabilities of nor-

Lithospheric Seismology

An open meeting will be held at the La Jolla Convention Center in Madison, Wis., January 13-14, 1984, to formulate the organizational plan for an institutionally based consortium for lithospheric and other portable array seismology. It is hoped that participants will represent a wide spectrum of geophysics and geology to assure that the plan which emerges from the meeting reflects a broadly based consensus of the earth science community.

A new national program is being initiated whose goal is to acquire a minimum of 1000 matched, portable digital seismographs for carrying out high resolution, 3-dimensional seismic imaging of the continental lithosphere to depths well into the upper mantle. Present design plans call for microprocessor-based, multi-compo-

nent seismographs capable of programmed or triggered recording of earthquakes (including teleseisms) and artificial sources over user-selected bandwidth(s) within the range 0.01 to 200 Hz. The instruments are expected to be modular and of sufficient versatility that they can be used to address a diverse range of scientific problems (from microseismicity to surface wave tomography in deep earth structure) in addition to continental lithospheric imaging.

Those interested in attending the Madison meeting may obtain further information by writing to Organizing Committee, CIW/UTM, 5511 Broad Branch Rd., N.W., Washington, DC 20015, or by calling David James (202-966-0863) or Bob Meyer (202-262-1088).

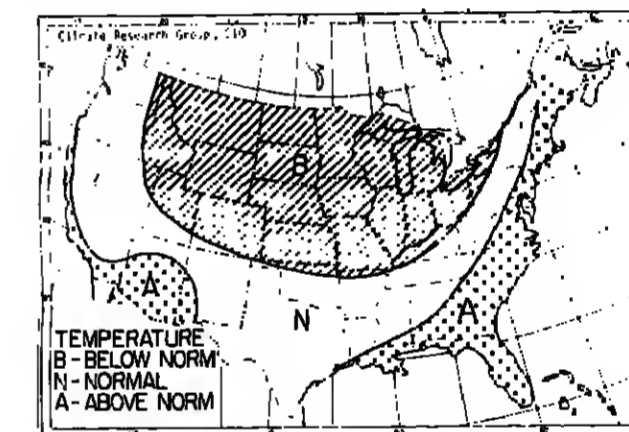
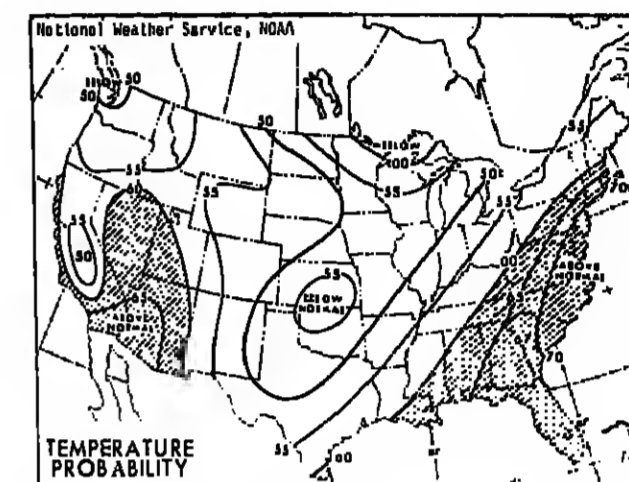


Fig. 1. Temperature predictions for the 1983-1984 winter, defined as December through and including February. (top) The National Weather Service winter outlook uses probability contours. (bottom) Prediction made by Jerome Namias and Daniel Cayan of the Scripps Institution of Oceanography (SIO) uses the above-normal, below-normal, and normal labels.

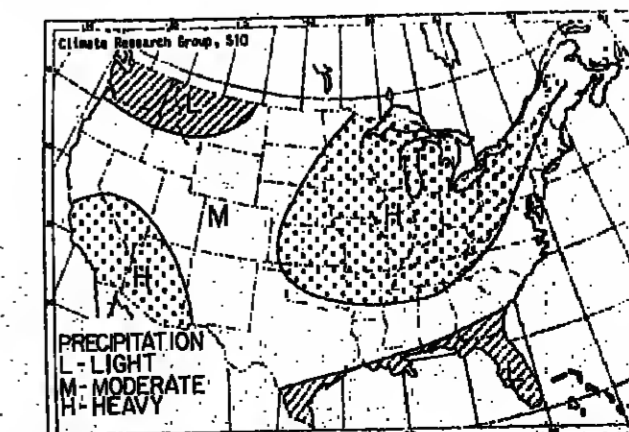
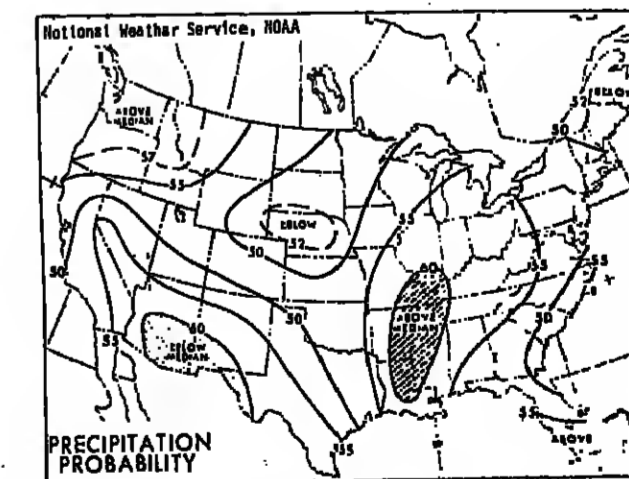
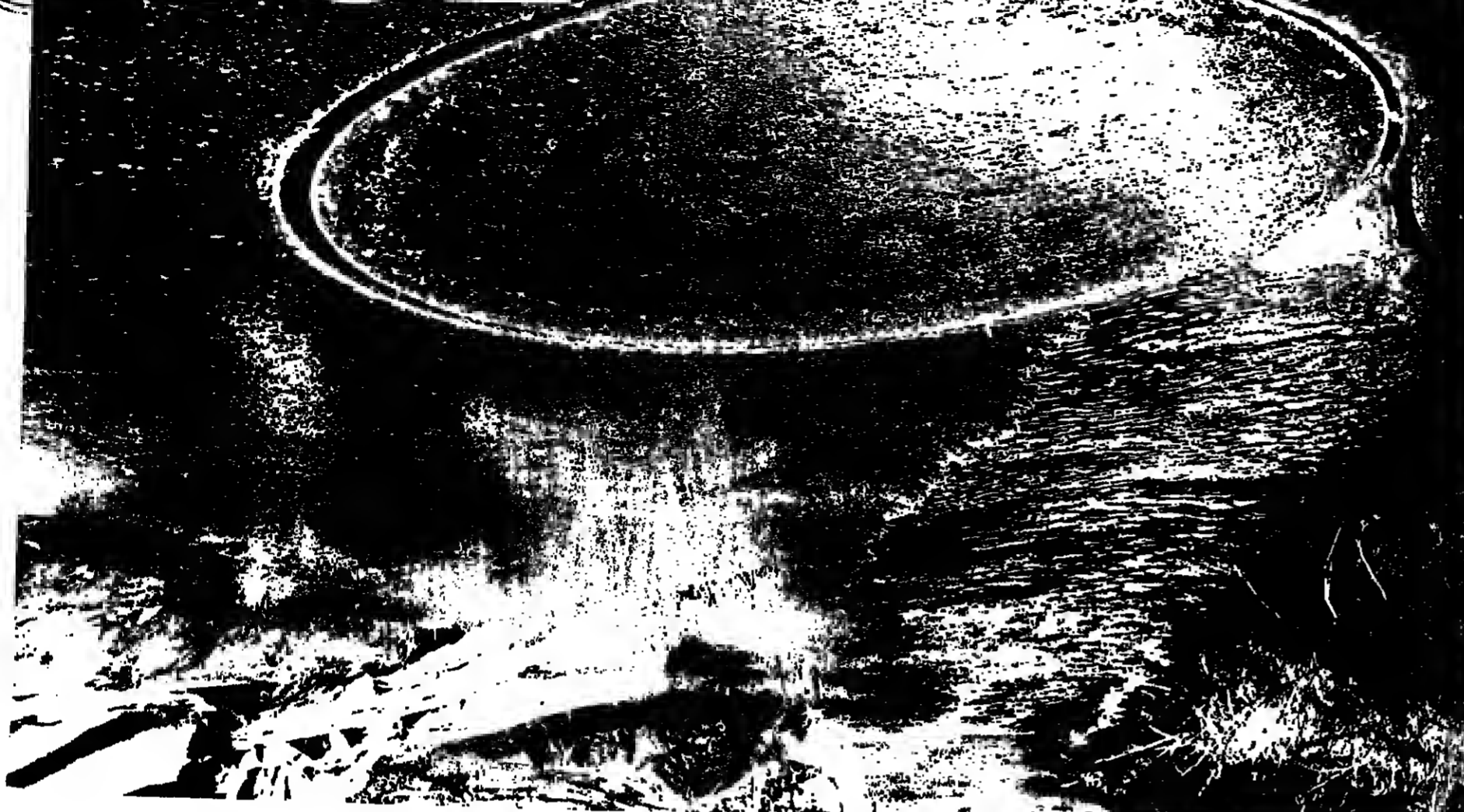


Fig. 2. Precipitation predictions for the 1983-1984 winter. The National Weather Service outlook (top) and the SIO researchers' outlook (bottom) differ markedly.

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December 13, 1983

Exploration Geophysics

0930 Magnetic and electrical methods
ELECTROMAGNETIC IMAGING OF THERMO-ELASTIC DEFORMATIONS IN LAYERED EARTH USING INVERTED EQUATIONS
Philip A. Vannam, Earth Sciences Laboratory, 420 Chippewa Way, Box 120, Oak Lake City, UT 84041; Gerald E. Johnson, and William A. Hurlbut
We have developed an algorithm based on the method of integral equations to simulate the electromagnetic responses of three-dimensional bodies in layered earth. The inhomogeneities are replaced by an equivalent body functions. A matrix equation is constructed using layered earth, and it is solved for the vector current by integrating magnetic and magnetic tensor Green's functions over the scattering currents.

A comparison of responses over elongate three-dimensional (3-D) bodies with responses over using plane wave incident fields in the only checked, however, the length that a 3-D body must have before corresponding 3-D responses are insignificant depends strongly on the layering. The 3-D responses magnetic and corresponding 3-D calculations agree closely (*GEOPHYSICS*, Vol. 48, No. 1).

0930 Magnetic and electrical methods
DEEP DRIFTING ANOMALOUS DATA INDICES TOBARI-100000
V.L.S. Srinivasulu, U.S. Geological Survey, Box 23464, MS 984, Denver Federal Center, Denver, CO 80223; David Campbell

Concurrence to induction, draped geomagnetic surveys have been used to map the magnetic field of the earth. The induction of the total magnetic field of various depths support this conclusion. In areas where draped profiles exhibit steeper gradients and steeper profiles, the induction of the magnetic field is more significant. On the surface, the induction of the magnetic field is more significant. On the surface, the induction of the magnetic field is more significant. On the surface, the induction of the magnetic field is more significant.

0930 Seismic methods
MODELING THE EFFECT OF STATION GEOMETRY IN SEISMIC RECORDING
J. A. S. Srinivasulu, U.S. Geological Survey, Box 23464, MS 984, Denver Federal Center, Denver, CO 80223; David Campbell

At effective way of exploring for structural features depth and location, the area of acquisition is limited to a narrow range of frequencies. However, the efficiency of the seismic method is greatly enhanced by the use of a wide range of frequencies. The efficiency of the seismic method is greatly enhanced by the use of a wide range of frequencies. The efficiency of the seismic method is greatly enhanced by the use of a wide range of frequencies.

containing numerous small planar faults. The surface topography is flat, but it contains deep crevasses and valleys filled with glacial drift which produce time static corrections. To produce the effect of static corrections, a model was designed to produce data resembling those taken over a planar fault. Seismic data were collected over this model by a method simulating the power envelope and the instantaneous phase of the seismic data. The model was designed to produce data resembling those taken over a planar fault. Seismic data were collected over this model by a method simulating the power envelope and the instantaneous phase of the seismic data.

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GEOS-1000 SEISMIC SURVEY APPLICATIONS FOR STUDYING SUBSURFACE FRACTURE SYSTEMS AT A HOT DRY ROCK GEOTHERMAL SITE
Richard P. Bohl, Department of Geology, Oregon State University, Corvallis, OR 97331; Chris Pearson

The use of cross borehole seismic surveys for delineating the location and size of subsurface fracture systems is investigated. The radiation pattern for a borehole seismic survey is derived. The radiation pattern for a borehole seismic survey is derived. The radiation pattern for a borehole seismic survey is derived.

Using the radiation pattern for a borehole seismic survey, we have developed a technique to calculate the location and size of subsurface fracture systems. The radiation pattern for a borehole seismic survey is derived. The radiation pattern for a borehole seismic survey is derived. The radiation pattern for a borehole seismic survey is derived.

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An analysis of the seismic waves scattered by the seabed is presented. The analysis is based on the theory of scattering by a rough surface. The analysis is based on the theory of scattering by a rough surface. The analysis is based on the theory of scattering by a rough surface.

due to the laterally varying part of the seabed, the scattered waves are added to the seismic waves. The scattered waves are added to the seismic waves. The scattered waves are added to the seismic waves.

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